MEDFORD HIGH SCHOOL  
COURSE SYLLABUS

Department:  
Mathematics

Course Title:  
Explorations in Computer Programming

Level and/or Grade:  
Standard; Grade 12

Prerequisite:  
Passing grade in Algebra 2

Course Description:

This course provides an introduction to the development of computer programming techniques using several programming languages including Scratch and Python. Students are given the opportunity to analyze problem descriptions and design programming solutions using common problem-solving techniques. Additionally, students will locate and correct errors in programs and create appropriate program documentation. This course is designed for students with no previous programming experience. The students will create computer programs that model real-world problems and solutions. A majority of the class time will be spent in hands-on lab activities.

Learning Standards*: Through communication, representation, reasoning, making connections, and problem solving, students will be able to...

Mathematical Practice:
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Number and Quantity:
- Represent and manipulate data in matrices.
- Multiply matrices by scalars.
- Add, subtract, and multiply matrices.

Algebra:
- Create equations in one variable and use them to solve problems.
- Create equations in two variables to represent relationships between quantities. Manipulate and evaluate the equations.
- Derive the formula for the sum of a finite geometric series; use the formula to solve problems.
- Add, subtract, and multiply polynomials.
- Apply the Binomial Theorem to solve problems.

Functions:
- Represent and manipulate data in matrices.
- Understand what a function is. Identify the domain and range of a function.
- Evaluate functions and interpret their results. Use function notation.
- Translate among different representations of functions and relations: equations, point sets, and tables.

Geometry:
- Draw a polygon and find its’ perimeter.
- Draw two-dimensional cross-sections of a three-dimensional shape.
- Represent objects with geometric shapes and appropriate measurements.
Statistics and Probability:

- Find the conditional probability of A given B. Interpret the answer in terms of the model.
- Use the Addition Rule in a probability model. Interpret the answer.
- Use the Multiplication Rule in a probability model. Interpret the answer.

*from the 2011 Massachusetts Curriculum Framework for Mathematics

Course Alignment with 21st Century Learning Expectations:

Students will…

1. Become self-directed learners as they
   - Set goals and responsibility for learning.
   - Select strategies for problem solving.
   - Monitor one’s own learning through reflection.

2. Communicate effectively as they
   - Express ideas precisely and with coherence.
   - Use a variety of representations to express mathematics to multiple audiences.
   - Use appropriate vocabulary and symbolic notation effectively.

3. Apply problem-solving skills and critical and creative thinking as they
   - Apply mathematical knowledge to new, non-routine situations.
   - Evaluate and test different routes to solving a problem.
   - Demonstrate persistence.

4. Use technology appropriately as a tool for learning, collaboration, presentation, research, and design as they
   - Demonstrate proficiency with the graphing calculator as a tool for learning.
   - Communicate and collaborate with educators and peers using online systems.
   - Use technology strategically for independent learning, calculation and representation.

5. Act with integrity, respect and responsibility toward themselves, others, and the environment as they
   - Actively participate in class and demonstrates respectful behavior.
   - Respond to new and diverse perspectives.
   - Critique the work of others and accept the critique of others.

6. Exhibit flexibility and adaptability as they
   - Recognize mistakes as an essential part of learning.
   - Revise thinking to apply in context.
   - Approach new experiences with confidence.

7. Collaborate in diverse groups to share knowledge, build consensus, and achieve goals as they
   - Work in pairs and small groups to discuss and problem solve.
   - Construct team positive interactions.
   - Discuss a variety of viewpoints and demonstrate logical reasoning to make decisions.

8. Practice leadership in and service to their community as they
   - Support their peers in learning mathematics.
   - Participate in departmental activities that promote the understanding mathematics.
   - Use mathematical models to solve community problems.

9. Become contributing citizens in a global society as they
   - Understand the role of mathematics in shaping the world.
   - Exchange ideas and resources beyond the classroom.
   - Make career choices that positively impact future of the mathematical learning.

Assessment:

- See attached grading policy.